UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EXPOSURE RESEARCH LABORATORY
HUMAN EXPOSURE & ATMOSPHERIC SCIENCES DIVISION (MD-46)
Research Triangle Park, NC 27711
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Office of
Research and Development

LIST OF DESIGNATED REFERENCE AND EQUIVALENT METHODS

Issue Date: **March 24, 2000**
(www.epa.gov/ttn/amtic/criteria.html)

These methods for measuring ambient concentrations of specified air pollutants have been designated as "reference methods" or "equivalent methods" in accordance with Title 40, Part 53 of the Code of Federal Regulations (40 CFR Part 53). Subject to any limitations (e.g., operating range or temperature range) specified in the applicable designation, each method is acceptable for use in state or local air quality surveillance systems under 40 CFR Part 58 unless the applicable designation is subsequently canceled. Automated methods for pollutants other than PM_{10} are acceptable for use only at shelter temperatures between 20EC and 30EC and line voltages between 105 and 125 volts unless wider limits are specified in the method description.

Prospective users of the methods listed should note (1) that each method must be used in strict accordance with its associated operation or instruction manual and with applicable quality assurance procedures, and (2) that modification of a method by its vendor or user may cause the pertinent designation to be inapplicable to the method as modified. (See Section 2.8 of Appendix C, 40 CFR Part 58 for approval of modifications to any of these methods by users.)

Further information concerning particular designations may be found in the *Federal Register* notice cited for each method or by writing to the National Exposure Research Laboratory, Human Exposure and Atmospheric Sciences Division (MD-46), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. Technical information concerning the methods should be obtained by contacting the source listed for each method. Source addresses are listed at the end of the listing of methods, except for the addresses for lead method sources, which are given with the method. New analyzers or PM_{10} samplers sold as reference or equivalent methods must carry a label or sticker identifying them as designated methods. For analyzers or PM_{10} samplers sold prior to the designation of a method with the same or similar model number, the model number does not necessarily identify an analyzer or sampler as a designated method. Consult the manufacturer or seller to determine if a previously sold analyzer or sampler can be considered a designated method or if it can be upgraded to designation status. Analyzer users who experience operational or other difficulties with a designated analyzer or sampler and are unable to resolve the problem directly with the instrument manufacturer may contact EPA (preferably in writing) at the above address for assistance.

This list will be revised as necessary to reflect any new designations or any cancellation of a designation currently in effect. The most current revision of the list will be available for inspection at EPA's Regional Offices, and copies may be obtained by writing to the National Exposure Research Laboratory at the address specified above.

Most Recent Designations

DKK Corp. Model GUX-113E U. V. Ozone Analyzer	March 2, 2000
DKK Corp. Model GFS-112E U.V. Fluorescence SO_2 Analyzer	January 18, 2000
Andersen RAAS10-100, RAAS10-200, RAAS10-300 PM_{10} Samplers	June 23, 1999
Rupprecht & Patashnick Partisol® Model 2000 PM-2.5 Audit Sampler	April 19, 1999
Andersen Model RAAS2.5-200 PM2.5 Audit Air Sampler	March 11, 1999

SULFUR DIOXIDE

Reference Method for SO_2 (Pararosaniline Method) *Manual Reference Method:* **40 CFR Part 50, Appendix A**
Reference Method for the Determination of Sulfur Dioxide in the Atmosphere (Pararosaniline Method)
[*Federal Register:* Vol 47, page 54899, 12/06/82 and Vol 48, 17355, 04/22/83]

Pararosaniline Method for SO_2 - Technicon I *Manual Equivalent Method:* **EQS-0775-001**
"Pararosaniline Method for the Determination of Sulfur Dioxide in the Atmosphere-Technicon I Automated Analysis System"
[*Federal Register:* Vol 40, page 34024, 08/13/75]

Pararosaniline Method for SO_2 - Technicon II *Manual Equivalent Method:* **EQS-0775-002**
"Pararosaniline Method for the Determination of Sulfur Dioxide in the Atmosphere-Technicon II Automated Analysis System"
[*Federal Register:* Vol 40, page 34024, 08/13/75]

Advanced Pollution Instrumentation, Inc. Model 100 SO_2 Analyzer *Automated Equivalent Method:* **EQSA-0990-077**
"Advanced Pollution Instrumentation, Inc. Model 100 Fluorescent SO_2 Analyzer," operated on the 0-0.1 ppm[1], the 0-0.2 ppm[1], the 0-0.5 ppm, or the 0-1.0 ppm range with a 5-micron TFE filter element installed in the rear-panel filter assembly, either a user- or vendor-supplied vacuum pump capable of providing 20 inches of mercury vacuum at 2.5 L/min, with or without any of the following options: Internal Zero/Span; Pump Pack; Rack Mount With Slides; RS-232 Interface; Status Output; TFE Zero/Span Valves; Zero Air Scrubber; Dual Range.[2] [*Federal Register:* Vol. 55, page 38149, 09/17/90]

Advanced Pollution Instrumentation, Inc.
Models 100A and 100AS SO_2 Analyzer *Automated Equivalent Method:* **EQSA-0495-100**
"Advanced Pollution Instrumentation, Inc. Model 100A or 100AS Sulfur Dioxide Analyzer," operated on any full scale range between 0-50 ppb[1] and 0-1000 ppb, at any temperature in the range of 5 to 40 degrees C, with a 5-micron TFE filter element installed in the filter assembly, with either the vendor-supplied internal pump or a user- or vender-supplied external vacuum pump capable of maintaining an absolute pressure of 35 cm (14 inches) of mercury (or less) at 1.0 standard liter per minute flow rate, with the following software settings: Dynamic zero: OFF or ON; Dynamic span: OFF; AutoCal: ON or OFF; Dual range: ON or OFF; Autorange: ON or OFF; Temp/pressure compensation: ON; dilution factor: 1.0; and with or without any of the following options: [2]

Rack mount with chassis slides	Rack mount without slides, ears only	Fluorocarbon zero/span valves	
Internal zero/span (IZS)	4-20 mA, isolated outputs	External pump	
Status outputs	Rack mount for external pump with tray	RS-232 output	Combustion Filter
SO_2 Permeation tube, uncertified, 0.4 ppm @ 0.7 L/min	SO_2 Permeation tube, certified, 0.4 ppm @ 0.7 L/min		
SO_2 Permeation tube, uncertified, 0.8 ppm @ 0.7 L/min	SO_2 Permeation tube, certified, 0.8 ppm @ 0.7 L/min		

[*Federal Register*: Vol. 60, page 17061, 04/04/95]

ASARCO Model 500 SO_2 Monitor *Automated Equivalent Method:* **EQSA-0877-024**
"ASARCO Model 500 Sulfur Dioxide Monitor," operated on a 0-0.5 ppm range; or "ASARCO Model 600 Sulfur Dioxide Monitor," operated on a 0-1.0 ppm range. (Both models are identical except for the range.) NOTE: This method is not now commercially available. [*Federal Register:* Vol 42, page 44264, 09/02/77 and Vol 44, page 67522, 11/26/79]

Beckman Model 953 Fluorescent Ambient SO_2 Analyzer *Automated Equivalent Method:* **EQSA-0678-029**
"Beckman Model 953 Fluorescent Ambient SO_2 Analyzer," operated on a range of either 0-0.5 or 0-1.0 ppm, with a time constant setting of 2, 2.5, or 3 minutes, a 5 to 10 micron membrane filter element installed in the rear-panel filter assembly, with or without any of the following options: Remote Operation Kit, Catalog No. 641984; Digital Panel Meter, Catalog No. 641710; Rack Mount Kit, Catalog No. 641709; Panel Mount Kit, Catalog No. 641708. [*Federal Register:* Vol 43, page 35995, 08/14/78]

Bendix Model 8303 Sulfur Analyzer *Automated Equivalent Method:* **EQSA-1078-030**
"Bendix Model 8303 Sulfur Analyzer," operated on a range of either 0-0.5 or 0-1.0 ppm, with a Teflon filter installed on the sample inlet of the H_2S scrubber assembly. [*Federal Register:* Vol 43, page 50733, 10/31/78]

Columbia Scientific Industries Model 5700 SO_2 Analyzer *Automated Equivalent Method:* **EQSA-0494-095**

"Columbia Scientific Industries Model 5700 Sulfur Dioxide Analyzer", operated with software version 1.0 on any full scale range between 0-250 ppb[1] and 0-1000 ppb, at any integration time setting from 20 to 99 seconds, at any temperature in the range of 15EC to 30EC, at any AC line voltage in the range of 105 to 130 volts, and with or without any of the following options:

964-0121 Alarm Relay Contacts
964-0122 Input Solenoids
964-0124 Dual Analog Voltage Outputs
964-0125 Dual Current Outputs
964-0126 Printer
964-0131 Rack Mount
964-0012 Single Headed Pump

[*Federal Register:* Vol 59, page 18818, 04/20/94]

Dasibi Model 4108 U.V. Fluorescence SO_2 Analyzer *Automated Equivalent Method:* **EQSA-1086-061**

"Dasibi Model 4108 U.V. Fluorescence SO_2 Analyzer," operated with a range of 0-100 ppb[1], 0-200 ppb[1], 0-500 ppb, or 0-1000 ppb, with a Teflon-coated particulate filter and continuous hydrocarbon removal system, with or without any of the following options: Rack Mounting Brackets And Slides; RS-232-C Interface; Temperature Correction. [*Federal Register:* Vol 51, page 32244, 09/10/86]

DKK Corp. Model GFS-32 U.V. Fluorescent SO_2 Analyzer *Automated Equivalent Method:* **EQSA-0701-115**

"DKK Corporation Model GFS-32 Ambient Air SO_2 Ultraviolet Fluorescent Analyzer, operated within the 0.000 to 0.500 ppm range in the temperature range of 20EC to 30EC. [*Federal Register:* Vol 62, page 44007, 08/18/97]

DKK Corp. Model GFS-112E U. V. Fluorescent SO_2 Analyzer *Automated Equivalent Method:* **EQSA-0100-133**

"DKK Corporation Model GFS-112E U.V. Fluorescence SO_2 Analyzer," operated at any temperature ranging from 15° C to 35° C and on any of the following measurement ranges: 0-0.05 ppm, 0-0.100 ppm, 0-0.200 ppm, 0-0.5 ppm, or 0-1.000 ppm.

[*Federal Register:* Vol 65, page 2610, 01/18/00]

Environnement S.A. Model AF21M SO_2 Analyzer *Automated Equivalent Method:* **EQSA-0292-084**

"Environnement S.A. Model AF21M Sulfur Dioxide Analyzer," operated on a range of 0-0.5 ppm with a response time coefficient setting of 01, a Teflon filter installed in the rear-panel filter assembly, and with or without any of the following options: Rack Mount/Slides; RS-232-C Interface. [*Federal Register:* Vol 57, page 5444, 02/14/92]

Horiba Models APSA-360, APSA-360-CE, or APSA-360A-CE SO_2 Monitors *Automated Equivalent Method:* **EQSA-0197-114**

"Horiba Instruments, Inc. Model APSA-360 and Model APSA-360-CE Ambient Sulfur Dioxide Monitor,"operated with a full scale range of 0 - 0.50 ppm, at any temperature in the range of 5 EC to 40 EC, with a Line Setting of "MEASURE", an Analog Output Setting of "MOMENTARY VALUE", and with or without any of the following options:[2]

1) Rack Mounting Plate and Side Rails, 2) RS-232 Communications Port, and 3) Internal zero gas and span gas generator.

"Horiba Instruments, Inc. Model APSA-360A-CE Ambient Sulfur Dioxide Monitor," operated with one of the following measurement ranges: 0-0.05 ppm, 0-0.1 ppm, 0-0.2 ppm, 0-0.5 ppm or 0-1.0 ppm; with selectable time constants from 10 to 300 seconds; at any temperature in the range of 5EC to 40 EC; and with or without the optional internal zero gas and span gas generator.

[*Federal Register*: Vol 63, page 31992, 06/11/98]

Lear Siegler Model AM2020 SO_2 Monitor *Automated Equivalent Method:* **EQSA-0486-049**

"Lear Siegler Model AM2020 Ambient SO_2 Monitor," operated on a range of either 0-0.5 or 0-1.0 ppm, at a wavelength of 299.5 nm, with a 5 minute integration period, over any 10EC temperature range between 20EC and 45EC, with or without the automatic zero and span correction feature. [*Federal Register:* Vol 45, page 79574, 12/01/80 and Vol 46, page 9997, 01/30/81]

Lear Siegler Model SM1000 SO_2 Monitor *Automated Equivalent Method:* **EQSA-1275-005**

"Lear Siegler Model SM1000 SO_2 Ambient Monitor," operated on the 0-0.5 ppm range, at a wavelength of 299.5 nm, with the "slow" (300 second) response time, with or without any of the following options: SM-1 Internal Zero/Span; SM-2 Span Timer Card; SM-3 0-0.1 Volt Output; SM-4 0-5 Volt Output; SM-5 Alternate Sample Pump; SM-6 Outdoor Enclosure. [*Federal Register:* Vol 41, page 3893, 01/27/76; Vol 41, page 32946, 08/06/76; Vol 42, page 13044, 03/08/77; Vol 45, page 1147, 01/04/80]

Meloy Model SA185-2A SO_2 Analyzer *Automated Equivalent Method:* **EQSA-1275-006**

"Meloy Model SA185-2A Sulfur Dioxide Analyzer," operated on the 0-0.5 ppm range, with or without any of the following options:

S-1 Linearized Output
S-2 Modified Recorder Output
S-18 Rack Mount Conversion
S-24 Dual Range Linearized Output
S-5 Teflon-Coated Block
S-18A Rack Mount Conversion
S-33 Remote Range Control And Status
S-6A Reignite Timer Circuit
S-21Front Panel Digital (Signals)
S-7 Press To Read Volt Meter
S-34 Remote Control
S-11A Manual Zero And Span
S-22 Remote Zero/Span Control And Status (Timer)
S-35 Front Panel Digital Meter With BCD Output
S-11B Automatic Zero And Span
S-13 Status Lights
S-22A Remote Zero/Span Control
S-36 Dual Range Log-Linear Output
S-14 Output Booster Amplifier
S-23 Automatic Zero Adjust
S-38 Sampling Mode Status
S-14B Line Transmitter Board
S-23A Automatic/Manual Zero Adjust

or operated on the 0-1.0 ppm range with either option S-36 or options S-1 and S-24, with or without any of the other options.

[*Federal Register:* Vol 41, page 3893, 01/27/76 and Vol 43, page 38088, 08/25/78]

Meloy Model SA285E SO_2 Analyzer *Automated Equivalent Method:* **EQSA-1078-032**

"Meloy Model SA285E Sulfur Dioxide Analyzer," operated on the following ranges and time constant switch positions:

Range, ppb:	0-50[1]	0-100[1]	0-500, 0-1000
Time Constant Setting:	1 or 10	1 or 10	off, 1 or 10	off, 1 or 10

The analyzer may be operated at temperatures between 10EC and 40EC and at line voltages between 105 and 130 volts, with or without any of the following options:

S-5 Teflon Coated Block
S-22B Remote Zero/Span Control And Status (Pulse)
S-30 Auto Reignite
S-14B Line Transmitter Board
S-32 Remote Range Control And Status
S-18 Rack Mount Conversion
S-23 Auto Zero Adjust
S-35 Front Panel Digital Meter With BCD Output
S-18A Rack Mount Conversion
S-23A Auto/Manual Zero Adjust
S-21 Front Panel Digital Meter
S-25 Press To Read
S-37 Temperature Status Lights
S-22 Remote Zero/Span Control And Status (Timer)
S-26 Manual Zero And Span
S-38 Sampling Mode Status
S-27 Auto Manual Zero/Span
S-22A Remote Zero/Span Control
S-28 Auto Range And Status

[*Federal Register:* Vol 43, page 50733, 10/31/78]

Meloy Model SA 700 Fluorescence Sulfur Dioxide Analyzer *Automated Equivalent Method:* **EQSA-0580-046**

"Meloy Model SA 700 Fluorescence Sulfur Dioxide Analyzer," operated on the 0-250 ppb[1], the 0-500 ppb, or the 0-1000 ppb range with a time constant switch position of either 2 or 3. The analyzer may be operated at temperatures between 20EC and 30EC and at line voltages between 105 and 130 volts, with or without any of the following options: FS-1 Current Output; FS-2 Rack Mount Conversion; FS-2A Rack Mount Conversion; FS-2B Rack Mount Conversion; FS-3 Front Panel Mounted Digital Meter; FS-5 Auto/Manual Zero/Span With Status; FS-6 Remote/Manual Zero/Span With Status; FS-7 Auto Zero Adjust.

[Federal Register: Vol 45, page 31488, 05/13/80]

Monitor Labs Model 8450 Sulfur Monitor *Automated Equivalent Method:* **EQSA-0876-013**

"Monitor Labs Model 8450 Sulfur Monitor", operated on a range of either 0-0.5 or 0-1.0 ppm, with a 5 second time constant, a model 8740 hydrogen sulfide scrubber in the sample line, with or without any of the following options: BP Bipolar Signal Processor; IZS Internal Zero/Span Module; V Zero/Span Valves; CLO Current Loop Output; TF TFE Sample Particulate Filter; VT Zero/Span Valves And Timer; DO Status Remote Interface.

[*Federal Register:* Vol 41, page 36245, 08/27/76 and Vol 44, page 33476, 06/11/79]

Monitor Labs/Lear Siegler Model 8850 SO_2 Analyzer *Automated Equivalent Method:* **EQSA-0779-039**

"Monitor Labs or Lear Siegler Model 8850 Fluorescent SO_2 Analyzer," operated on a range of either 0-0.5 or 0-1.0 ppm, with an internal time constant setting of 55 seconds, a TFE sample filter installed on the sample inlet line, with or without any of the following options: 03A Rack; 03B Slides; 05A Valves Zero/Span; 06A IZS Internal Zero/Span Source; 06B,C,D NIST Traceable Permeation Tubes; 08A Pump; 09A Rack Mount For Option 08A; 010 Status Output W/Connector; 013 Recorder Output Options; 014 DAS Output Options; 017 Low Flow Option; 018 Kicker. [*Federal Register:* Vol 44, page 44616, 07/30/79]

Monitor Labs/Lear Siegler Model 8850S SO_2 Analyzer *Automated Equivalent Method:* **EQSA-0390-075**

"Monitor Labs or Lear Siegler Model 8850S SO_2 Analyzer," operated on a range of either 0-0.5 or 0-1.0 ppm.

[*Federal Register:* Vol 55, page 5264, 02/14/90]

Monitor Labs/Lear Siegler Model ML9850, *Automated Equivalent Method:* **EQSA-0193-092**
Monitor Labs Model ML9850B, or Wedding & Associates Model 1040 SO_2 Analyzers

"Lear Siegler Measurement Controls Corporation or Monitor Labs Model ML9850, Monitor Labs Model ML9850B, or Wedding & Associates, Inc. Model 1040 Sulfur Dioxide Analyzers," operated on any full scale range between 0-0.050 ppm[1] and 0-1.0 ppm, at any temperature in the range of 15EC to 35EC, with the service switch on the secondary panel set to the *In* position; with the following menu choices selected: Range: *0.05 ppm to 1.0 ppm*; Over-ranging: *Enabled* or *Disabled*; Background: *Not Disabled*; Calibration: *Manual* or *Timed*; Diagnostic Mode: *Operate*; Filter Type: *Kalman*; Pres/Temp/Flow Comp: *On*; Span Comp: *Disabled*; and as follows: **Model ML9850** - with a five-micron Teflon® filter element installed internally, with the 50-pin I/O board installed on the rear panel configured at any of the following output range settings: Voltage, 0.1 V, 1 V, 5 V, 10 V; Current, 0-20 mA, 2-20 mA, 4-20 mA; and with or without any of the following options: Valve Assembly for External Zero/Span (EZS); Rack Mount Assembly; Internal Floppy Disk Drive. **Models ML9850B and 1040** - with either a vendor-supplied or equivalent user supplied five-micron Teflon® filter, zero air scrubber, and exhaust pump, and with or without any of the following options: Valve Assembly for External Zero/Span (EZS); Rack Mount Assembly; 50-pin I/O board; Exhaust Scrubber; Internal Zero/Span Assembly (IZS); hinged, fold-down front panel. [*Federal Register:* Vol 58, page 6964, 02/03/93]

Opsis Model AR 500 and System 300 Open Path Ambient Air Monitoring Systems for SO_2 *Automated Equivalent Method:* **EQSA-0495-101**

"Opsis Model AR 500 System" or "System 300" Open Path (long path) Ambient Air Monitoring Systems, configured for measuring SO_2, with one detector and movable grating, operated with a measurement range of 0 to 0.5 ppm or 0 to 1.0 ppm, an installed monitoring path length between 20 and 500 meters (or 20 and 1000 meters with the ER 150 option, AR 500 System only), xenon lamp type B (150 watt), fiber optic cable length between 3 to 20 meters; operating within an ambient air temperature range of -50 to +50EC, an analyzer temperature range of 20 to 30EC, a measurement (integrating) time setting between 30 and 120 seconds (0 min:30 sec. to 2 min:00 sec.), and with a complete cycle time of not more than 200 seconds (3 min, 20 sec.). Under this method designation, the Model AR 500 System or System 300 consists of: AR 500 opto-analyser; emitter EM 110 and receiver RE 110 (together identified as ER 110); optic fibre cable OF60-S; power supply PS 150; OPSIS operational software, version 7.0 or 7.1; and initial on-site installation, setup, and limited operator training.[2]

Optional components that can be used with the Model AR 500 only, in addition to or as alternative to corresponding components listed above:

AR 503 opto-analyzer configured as Model AR 500 (only the center detector active, sequential monitoring)
Emitter/receiver ER 150 (for monitoring path lengths up to 1 kilometer)
Transceiver ER 130 and Retroreflector RE 090 with:
7 prisms (max. monitoring path length 150 meters) or
12 prisms (max. monitoring path length 250 meters)
Receiver RE 130
Xenon lamp type A (higher short-wavelength UV output)
Optic fibre cable OF60-R (low-loss for short wavelengths)
Multiplexers MX 004 and MX 024
Dataloggers DL 010 and DL 016
Analogue and digital input/output cards AO 008, AI 016, and DI 032
Analogue and digital isolation cards IA 008, ID 008, OA 008, and OD 008,
Window heaters HF 110 and HF 150
Mirror heaters HM 110 and HM 150
Auto calibration unit CU 007
Software packages IO 80 (for the analogue and digital input/output adapters), DL10 and DL16 (for data loggers), COMVISION, and STAT 500;

Recommended calibration and accuracy audit components (or equivalent) for either Model AR 500 or System 300:

Wavelength calibration lamp CA 004
Calibration bench CB 100
Receiver unit RE 060 (two required)
Calibration unit CA 150, with same type lamp as used in the monitoring path emitter
Power supply PS 150 for calibration unit CA 150
Calibration cells CC 001-X, where X represents various cell lengths from 1 to 900 mm
Special calibration cells CC 110 or CC 150 (for mounting directly on receiver)
Light meter LM 010.

[*Federal Register*: Vol. 60, page 21518, 05/02/1995]

Philips PW9755 SO_2 Analyzer *Automated Equivalent Method:* **EQSA-0676-010**

"Philips PW9755 SO_2 Analyzer,"consisting of the following components: PW9755/02 SO_2 Monitor with PW9741/00 SO_2 Source, PW9721/00 Filter Set SO_2, PW9711/00 Electrolyte SO_2, PW9750/00 Supply Cabinet, PW9750/10 Supply Unit/ Coulometric, either PW9731/00 Sampler or PW9731/20 Dust Filter (or vendor-approved alternate particulate filter); operated with a 0-0.5 ppm range and with a reference voltage setting of 760 millivolts; with or without any of the following options: PW9750/30 Frame For MTT; PW9752/00 Air Sampler Manifold; PW9753/00 Mounting Rack For Accessories; PW9750/41 Control Clock 60 Hz; PW9754/00 Air Distributor. [*Federal Register:* Vol 41, page 26252, 6/25/76; Vol 41, page 46019, 10/19/76; Vol 42, page 28571, 6/03/77]

Philips PW9700 SO_2 Analyzer *Automated Equivalent Method:* **EQSA-0876-011**

"Philips PW9700 SO_2 Analyzer," consisting of the following components: PW9710/00 Chemical Unit with PW9711/00 Electrolyte SO_2, PW9721/00 Filter Set SO_2, PW9740/00 SO_2 Source; PW9720/00 Electrical Unit; PW9730/00 Sampler Unit (or vendor-approved alternate particulate filter); operated with a 0-0.5 ppm range and with a reference voltage of 760 millivolts.

[*Federal Register:* Vol 41, page 34105, 08/12/76]

Thermo Electron Model 43 SO_2 Analyzer *Automated Equivalent Method:* **EQSA-0276-009**

"Thermo Electron Model 43 Pulsed Fluorescent SO_2 Analyzer," equipped with an aromatic hydrocarbon cutter and operated on a range of either 0-0.5 or 0-1.0 ppm, with or without any of the following options: 001 Rack Mounting For Standard 19 Inch Relay Rack; 002 Automatic Actuation Of Zero And Span Solenoid Valves; 003 Type S Flash Lamp Power Supply; 004 Low Flow.

[*Federal Register:* Vol 41, page 8531, 02/27/76; Vol 41, page 15363, 04/12/76; Vol 42, page 20490, 04/20/77 Vol 44, page 21861, 04/12/79; Vol 45, page 2700, 01/14/80; Vol 45, page 32419, 05/16/80]

Thermo Environmental Instruments, Inc. Models 43A, 43B, 43C Analyzers *Automated Equivalent Method:* **EQSA-0486-060**

"Thermo Electron or Thermo Environmental Instruments, Inc. Model 43A or 43B Pulsed Fluorescence SO_2 Analyzer," operated on the 0-0.1 ppm[1], the 0-0.2 ppm[1], the 0-0.5 ppm, or the 0-1.0 ppm range, with either a high or a low time constant setting (Model 43A) and with or without any of the following options:[2]

001 Teflon Particulate Filter
002 19" Rack Mounting Configuration
003 Internal Zero/Span Valves
004 High Flow Rate (1 LPM)
005 Current Output
006 Internal Permeation Span Source
007 Remote Activation Of Zero/Span Valves
008 RS-232 Interface (Model 43B)
009 Pressure/Temperature Compensation (Model 43B)

"Thermo Environmental Instruments, Inc. Model 43C Pulsed Fluorescence SO_2 Analyzer," operated on any measurement range between 0-50 ppb[1] and 0-1000 ppb, with any time average setting from 10 to 300 seconds, with temperature and/or pressure compensation on or off, operated at temperatures between 20 °C and 30 °C, with or without any of the following options: [2]

43C-001 Teflon particulate filter
43C-002 Rack mounts
43C-003 Internal zero/span and sample solenoid valves
43C-004 High flow rate (0.5-1.0 LPM)
43C-005 4-20 mA current output
43C-006 Internal permeation span source
43C-007 Remote activation of zero/span and sample valves
43C-008 RS-232/485 interface

[*Federal Register:* Vol 51, page 12390, 04/10/86]

NOTES

[1] Users should be aware that designation of this analyzer for operation on ranges less than the range specified in the performance specifications for this analyzer (40 CFR 53, Subpart B) is based on meeting the same absolute performance specifications required for the specified range. Thus, designation of these lower ranges does not imply commensurably better performance than that obtained on the specified range.

[2] This analyzer is approved for use, with proper factory configuration, on either 50 or 60 Hertz line frequency and nominal power line voltages of 115 Vac and 220 Vac.

Sources or Contacts for Designated Reference and Equivalent Methods

ABB Process Analytics
P.O. Box 831
Lewisburg, WV 24901
(304) 647-4358

Advanced Pollution
Instrumentation, Inc.
6565 Nancy Ridge Drive
San Diego, CA 92121-2251
(619) 657-9800

Andersen Instruments
500 Technology Court
Smyrna, GA 30082-9211
(800) 241-6898

ASARCO Incorporated
3422 South 700 West
Salt Lake City, UT 84119
(801) 262-2459

Beckman Instruments, Inc.
Process Instruments Division
2500 Harbor Blvd.
Fullerton, CA 92634
(714) 871-4848

Bendix
[Refer to ABB Process Analytics]

BGI Incorporated
58 Guinan Street
Waltham, MA 02154

Columbia Scientific Industries
11950 Jollyville Road
Austin, TX 78759
(800) 531-5003

Combustion Engineering
[Refer to ABB Process Analytics]

Dasibi Environmental Corp.
506 Paula Avenue
Glendale, CA 91201
(818) 247-7601

DKK Corporation
4-13-14 Kichijoji Kitamachi,
Musashino-shi
Tokyo, 180, Japan

Environnement S.A
111, bd Robespierre
78300 Poissy, France
Instruments also available from:
Altech/Environnement U.S.A.
2623 Kaneville Court
Geneva, IL 60134
(630) 262- 4400
rbrown@altechusa.com

Environics, Inc.
69 Industrial Park Rd. E.
Tolland, CT 06084-2805
(203) 429-0077

Graseby GMW
[Refer to Andersen Instruments]

Horiba Instruments Incorporated
17671 Armstrong Avenue
Irvine, CA 92714
(800) 446-7422

Lear Siegler
[Refer to Monitor Labs, Inc.]

Commonwealth of Massachusetts
Department of Environmental
Quality Engineering
Tewksbury, MA 01876

Met One Instruments, Inc.
1600 Washington Blvd.
Grants Pass, OR 97526
(541) 471-7111
metone@metone.com

McMillan
[Refer to Columbia Scientific Industries]

Mine Safety Appliances
600 Penn Center Blvd.
Pittsburgh, PA 15235-5810
(412) 273-5101

Monitor Labs, Inc.
74 Inverness Drive
Englewood, CO 80112-5189
(800) 422-1499

Opsis AB, Furulund, Sweden
Instruments also available from:
Opsis, Inc.
146-148 Sound Beach Avenue
Old Greenwich, CT 06870
(203) 698-1810

State of Oregon
Department of Environmental Quality
Air Quality Division
811 S.W. Sixth Avenue
Portland, OR 97204

PCI Ozone Corp.
One Fairfield Crescent
West Caldwell, NJ 07006
(201) 575-7052

Phillips Electronic Instruments, Inc.
85 McKee Drive
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Wedding and Associates, Inc.
[Refer to Thermo Environmental
Instruments, Inc.]

U.S. EPA REFERENCE & EQUIVALENT METHODS FOR AMBIENT AIR

March 17, 2000

Method	Designation Number	Method Code
SO_2 Manual Methods		
Reference method (pararosaniline)	--	097
Technicon I (pararosaniline)	EQS-0775-001	097
Technicon II (pararosaniline)	EQS-0775-002	097
SO_2 Analyzers		
Advanced Pollution Instr. 100	EQSA-0990-077	077
Advanced Pollution Instr. 100A	EQSA-0495-100	100
Asarco 500	EQSA-0877-024	024
Beckman 953	EQSA-0678-029	029
Bendix 8303	EQSA-1078-030	030
Columbia Scientific Industries 5700	EQSA-0494-095	095
Dasibi 4108	EQSA-1086-061	061
DKK Corp. Model GFS-32	EQSA-0701-115	115
DKK Corp. Model GFS-112E	EQSA-0100-133	133
Environnement S.A. AF21M	EQSA-0292-084	084
Horiba Model APSA-360/APSA-360ACE	EQSA-0197-114	114
Lear Siegler AM2020	EQSA-1280-049	049
Lear Siegler SM1000	EQSA-1275-005	005
Lear Siegler or Monitor Labs ML9850, Monitor Labs ML9850B, Wedding 1040	EQSA-0193-092	092
Meloy SA185-2A	EQSA-1275-006	006
Meloy SA285E	EQSA-1078-032	032
Meloy SA700	EQSA-0580-046	046
Monitor Labs 8450	EQSA-0876-013	513
Monitor Labs or Lear Siegler 8850	EQSA-0779-039	039
Monitor Labs or Lear Siegler 8850S	EQSA-0390-075	075
Opsis AR 500, System 300 (open path)	EQSA-0495-101	101
Philips PW9700	EQSA-0876-011	511
Philips PW9755	EQSA-0676-010	010
Thermo Electron 43	EQSA-0276-009	009
Thermo Electron 43A or Thermo Environmental Instruments 43B, 43C	EQSA-0486-060	060
O_3 Analyzers		
Advanced Pollution Instr. 400/400A	EQOA-0992-087	087
Beckman 950A	RFOA-0577-020	020
Bendix 8002	RFOA-0176-007	007
Columbia Scientific Industries 2000	RFOA-0279-036	036
Dasibi 1003-AH,-PC,-RS	EQOA-0577-019	019
Dasibi 1008-AH	EQOA-0383-056	056
DKK Corp. Model GUX-113E	EQOA-0200-134	134
Environics 300	EQOA-0990-078	078
Environnement S.A. $O_3$41M	EQOA-0895-105	105
Horiba APOA-360	EQOA-0196-112	112
Lear Siegler or Monitor Labs ML9810, Monitor Labs ML9810B, Wedding 1010	EQOA-0193-091	091
McMillan 1100-1	RFOA-1076-014	514
McMillan 1100-2	RFOA-1076-015	515
McMillan 1100-3	RFOA-1076-016	016
Meloy OA325-2R	RFOA-1075-003	003
Meloy OA350-2R	RFOA-1075-004	004
Monitor Labs 8410E	RFOA-1176-017	017
Monitor Labs or Lear Siegler 8810	EQOA-0881-053	053
Opsis AR 500, System 300 (open path)	EQOA-0495-103	103
PCI Ozone Corp. LC-12	EQOA-0382-055	055
Philips PW9771	EQOA-0777-023	023
Thermo Electron or Thermo Environmental Instruments 49, 49C	EQOA-0880-047	047
CO Analyzers		
Advanced Pollution Instr. 300	RFCA-1093-093	093
Beckman 866	RFCA-0876-012	012
Bendix 8501-5CA	RFCA-0276-008	008
Dasibi 3003	RFCA-0381-051	051
Dasibi 3008	RFCA-0488-067	067
Environnement s.a. CO11M	RFCA-0995-108	108
Horiba AQM-10, -11, -12	RFCA-1278-033	033
Horiba 300E/300SE	RFCA-1180-048	048
Horiba APMA-360	RFCA-0895-106	106
Lear Siegler or Monitor Labs ML9830, Monitor Labs ML9830B, Wedding 1020	RFCA-0992-088	088
MASS - CO 1 (Massachusetts)	RFCA-1280-050	050
Monitor Labs 8310	RFCA-0979-041	041
Monitor Labs or Lear Siegler 8830	RFCA-0388-066	066
MSA 202S	RFCA-0177-018	018
Thermo Electron or Thermo Environmental Instruments 48, 48C	RFCA-0981-054	054
NO_2 Manual Methods		
Sodium arsenite (orifice)	EQN-1277-026	084
Sodium arsenite/Technicon II	EQN-1277-027	084
TGS-ANSA (orifice)	EQN-1277-028	098
NO_2 Analyzers		
Advanced Pollution Instr. 200	RFNA-0691-082	082
Advanced Pollution Instr. 200A	RFNA-1194-099	099
Beckman 952A	RFNA-0179-034	034
Bendix 8101-B	RFNA-0479-038	038
Bendix 8101-C	RFNA-0777-022	022
Columbia Scientific Indust.1600, 5600	RFNA-0977-025	025
Dasibi 2108	RFNA-1192-089	089
DKK Corp GLN-114E	RFNA-0798-121	121
Environnement S.A. AC31M	RFNA-0795-104	104
Horiba APNA-360	RFNA-0196-111	111
Lear Siegler or Monitor Labs ML9841, ML9841A, Monitor Labs ML9841B, Wedding 1030	RFNA-1292-090	090
Meloy NA530R	RFNA-1078-031	031
Monitor Labs 8440E	RFNA-0677-021	021
Monitor Labs or Lear Siegler 8840	RFNA-0280-042	042
Monitor Labs or Lear Siegler 8841	RFNA-0991-083	083
Opsis AR 500, System 300 (open path)	EQNA-0495-102	102
Philips PW9762/02	RFNA-0879-040	040
Thermo Electron or Thermo Environmental Instruments 14B/E	RFNA-0179-035	035
Thermo Electron or Thermo Environmental Instruments 14D/E	RFNA-0279-037	037
Thermo Environmental Instr. 42, 42C	RFNA-1289-074	074
Pb Manual Methods		
Reference method (hi-vol/AA spect.)	--	803
Hi-vol/AA spect. (alt. extr.)	EQL-0380-043	043
Hi-vol/Energy-disp XRF (TX ACB)	EQL-0783-058	058
Hi-vol/Energy-disp XRF (NEA)	EQL-0589-072	072
Hi-vol/Flameless AA (EMSL/EPA)	EQL-0380-044	044
Hi-vol/Flameless AA (Houston)	EQL-0895-107	107
Hi-vol/Flameless AA (Omaha)	EQL-0785-059	059
Hi-vol/ICAP spect. (Doe Run Co.)	EQL-0196-113	113
Hi-vol/ICAP spect. (EMSL/EPA)	EQL-0380-045	045
Hi-vol/ICAP spect. (Illinois)	EQL-1193-094	094
Hi-vol/ICAP spect. (Kansas)	EQL-0592-085	085
Hi-vol/ICAP spect. (Montana)	EQL-0483-057	057
Hi-vol/ICAP spect. (NE&T)	EQL-1188-069	069
Hi-vol/ICAP spect. (New Hampshire)	EQL-1290-080	080
Hi-vol/ICAP spect. (Pennsylvania)	EQL-0592-086	086
Hi-vol/ICAP spect. (Pima Co.,AZ)	EQL-0995-109	109
Hi-vol/ICAP spect. (Pima Co.,AZ)	EQL-0995-110	110
Hi-vol/ICAP spect. (Rhode Island)	EQL-0888-068	068
Hi-vol/ICAP spect. (Silver Val. Labs)	EQL-1288-070	070
Hi-vol/ICAP spect. (West Virginia)	EQL-0694-096	096
Hi-vol/WL-disp. XRF (CA A&IHL)	EQL-0581-052	052
PM_{10} Samplers		
Andersen Instruments,RAAS10-100	RFPS-0699-130	130
Andersen Instruments,RAAS10-200	RFPS-0699-131	131
Andersen Instruments,RAAS10-300	RFPS-0699-132	132
BGI Model PQ100	RFPS-1298-124	124
BGI Model PQ200	RFPS-1298-125	125
Oregon DEQ Medium volume sampler	RFPS-0389-071	071
Rupprecht & Patashnick Partisol 2000	RFPS-0694-098	098
R & P Partisol-FRM Model 2000	RFPS-1298-126	126
R & P Partisol-Plus Model 2025 Seq.	RFPS-1298-127	127
Sierra-Andersen/GMW 1200	RFPS-1287-063	063
Sierra-Andersen/GMW 321-B	RFPS-1287-064	064
Sierra-Andersen/GMW 321-C	RFPS-1287-065	065
Sierra-Andersen/GMW 241 Dichot.	RFPS-0789-073	073
W&A/Thermo Electron Mod 600 HVL	RFPS-1087-062	062
PM_{10} Analyzers		
Andersen Instruments Beta FH62I-N	EQPM-0990-076	076
Met One BAM1020, GBAM1020, BAM1020-1, GBAM1020-1	EQPM-0798-122	122
R & P TEOM 1400, 1400a	EQPM-1090-079	079
W&A/Thermo Electron 650 Beta Gauge	EQPM-0391-081	081
$PM_{2.5}$ Samplers		
Andersen Model RAAS2.5-200 Audit	RFPS-0299-128	128
BGI PQ200/200A	RFPS-0498-116	116
Graseby Andersen RAAS2.5-100	RFPS-0598-119	119
Graseby Andersen RAAS2.5-300	RFPS-0598-120	120
R & P Partisol-FRM 2000	RFPS-0498-117	117
R & P Partisol-Plus 2025	RFPS-0498-118	118
Thermo Envr Model 605 CAPS	RFPS-1098-123	123
R & P Partisol 2000 Audit	RFPS-0499-129	129
TSP Manual Method		
Reference method (high-volume)	--	802